

(51) Int Cl.:
H04N 5/775^(2006.01)

(22) Date of filing: 15.04.2009

(72) Inventors:

- **Tüzün, Levent**
45030, Manisa (TR)
- **Bal, Ertug**
45030, Manisa (TR)

(74) Representative: **Cayli, Hülya**
Paragon Consultancy Inc.
Koza Sokak No: 63/2
GOP
06540 Ankara (TR)

(54) Input Detection Device For Lower Stand-By Power Consumption

VCR-input detection and power control section (7) to monitor the stand-by mode operation of said device (1) and the connection of the first electrical device, and switching means (X1) to switch off said Video Buffer and Filter section (5) when both conditions of Stand-by mode of said device (1) and lack of connection of the first electrical device are met at the same time.



Description

FIELD OF THE INVENTION

[0001] The present invention is concerned with decreasing power consumption within set top boxes (STBs) or similar consumer electronic devices such as PVRs or DVD players, having SCART (from Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs) Loop Through feature.

BACKGROUND OF THE INVENTION

[0002] Nowadays many electronic devices within consumer electronics are not only capable of switching the power supply on and off, but also capable of waiting at stand-by mode, where a very popular demand in consumer electronics is to reduce the power consumption of electronic devices at standby mode.

[0003] Generally standby mode is used for reduced power consumption where only components used for receiving user commands and performing requested operations are operated in order to wake set top box from standby state to open state upon user request. However, some set top boxes support more features in standby state, one of those features is to transmit data signals received from another data source.

[0004] Digital receivers (set-top boxes-STB) generally support one VCR SCART and a TV SCART interface. VCR SCART can be used for a recording device (i.e. video-cassette recorder) as output. It can also be used for an input from another set-top box, such like a DVD player.

[0005] When VCR SCART is used as "input" user may switch this input from VCR-in to TV SCART output of set-top box with a switching mechanism, so called "SCART Loop Through". In stand-by mode (since there is no internal audio-video generation) user always gets data related to external device audio-video information from TV SCART (if available).

[0006] In STB's buffering, filtering and switching is maintained by separate circuits when an integrated SCART matrix is not used. This condition may require a more complex design; however it is easier to control inputs and outputs directly.

[0007] For both of schemes, all SCART input & output circuitry is run in either ON mode or in STBY mode because of the SCART Loop Through requirement. This implies extra power consumption if there is no input device.

[0008] A prior art system is disclosed in patent document EP 1 045 584 B1, where; a set top box is supplied by electricity of an external device if set top box is used for SCART Loop Through feature. However, the data buffer circuit within this patent document should always be in open active state, where a significant amount of energy is dissipated. Within the teaching of this technology it is also not possible to receive the image provided

by set top box receiver where SCART Loop Through feature is enabled.

BRIEF SUMMARY OF THE INVENTION

[0009] There is a need of reducing stand-by power consumption rates of consumer electronics devices (such as set-top boxes, PVRs and DVD players) which has VCR Input with SCART Loop Through functionality by shutting down video buffer circuits in stand-by mode until an electronic consumer device is connected to the VCR SCART input, so that stand-by power consumption will be lower. Further, there is the need of avoiding wake-up system just for SCART Loop Through operation.

[0010] Embodiments of the present invention provide an electrical device and the corresponding method, the device having a first and second SCART inputs for connection to a first and second electrical device, said device (1) comprising a Power Supply Unit (8), an Audio and Video Switching Circuit section (4) and a Video Buffer and Filter section (5) to allow for SCART Loop Through functionality. The electrical consumer device (1) additionally comprises a VCR-input and power control section (7) to monitor the stand-by mode operation of said device (1) and the connection of the first electrical device, and switching means (X1) to switch off said Video Buffer and Filter section (5) when both conditions of Stand-by mode of said device (1) and lack of connection of the first electrical device are met at the same time.

[0011] According to a preferred embodiments of the invention the electrical device has a VCR-in and power control section which has switching means (X1) to allow transfer of power from said Power Supply Unit (8) to said Video Buffer and Filter section (5), whereby power is switched off when said two conditions of Stand-by mode and lack of connection of the second electrical device are met at the same time. The switching means may be a P-Channel MOSFET whose base is connected via resistors (R4 and R5) to the collectors of two switching NPN transistors (Q1 and Q2) whose emitters may be connected to ground and whose bases may be respectively connected to the first SCART input and to the Stand-by signal (9) so that when said two conditions of Stand-by mode and lack of connection of the first electrical device are met at the same time, transistors Q1 and Q2 will be both switched off and switch X1 will be also off so that no power is supplied to said Video Buffer and Filter section (5). The presence of the first electrical appliance may be monitored using the Slow Blank signal available at pin 8 of the SCART connection to said first device.

[0012] Further preferred embodiments are described in the dependent claims.

BRIEF DESCRIPTION OF DRAWINGS

[0013] Specific embodiments of the invention are now described with reference to the accompanying drawings wherein :

Figure 1 illustrates a typical connection arrangement between a STB device and external devices such as VCR and TV, with a block diagram of the STB including the inventive features of the present invention.

Figure 2 illustrates a detailed electrical circuit diagram of one exemplary embodiment of the invention.

DESCRIPTION OF THE INVENTION

[0014] Figure 1 illustrates a block diagram of the claimed invention, wherein the indicated reference numbers in brackets are here described in their meaning and interfunctionality:

[1] The set-top box system which has a power supply (PSU), audio & video interfaces, and control units.

[2] An external device's audio & video signals are inputted via the VCR SCART input connection of the STB.

[3] The input signals from VCR SCART are transferred by switch circuit (4) and video buffer (5), note that signals are not buffered so they are not shown in the block diagram.

[4] Audio & Video signals taken from the System Back-End (internal) section and VCR input (external) are switched by a switching circuit (4). It is driven by system controller. In stand-by mode - since there is no internal audio & video - switching circuit works for VCR SCART input signals.

[5] Because of the voltage level specifications (from video interface ICs impedance differences) and noise coupling, a video buffer & filter circuit is used in video outputs of STBs.

[6] Slow Blank is a standard SCART Interface (pin#8) signal for detection of a connection and aspect ratio of transferred video.

[7] The invention is implemented by means of the VCR-in detection and Power control section (7). It receives Slow Blank and Stand-by signals and controls the power supply of the Video Buffer and Filter section (5). In the absence of both Slow Blank and STBY there is no power supply to the Video Buffer and Filter section (5), which case only happens in STBY mode and reduces STBY power consumption.

[8] PSU (power supply unit) can be any DC supply which is powering the Video Buffer and Filter section (5) via the Power Control section (7).

[9] System Back-End controller generates a STBY (standby) signal for indication of the state of the device for sub-blocks. This signal is active LOW in this case or absent for the operation of the invention.

[0015] A detailed embodiment of the invention is illustrated in Figure 2, where;

X1, **Q1** and **Q2** transistors are the main electronic components of the system:

- **X1** is a P-Channel MOSFET (model no is BSH205).
- **Q1&Q2** transistors are NPN BJT (model no is BC848).
- **V1** is the power source for video filter supply and it is generated by PSU (power supply unit). **VCC_F** is the Video Filter Supply input.

[0016] Control signals are **PIN8_VCR** and **STBY**:

- **PIN8_VCR** is VCR SCART pin#8 (Slow Blank). It may correspond to any DC value between 4.5V to 12V when an audio & video present in the VCR SCART. (according to SCART standards)
- **STBY** signal is generated by system microprocessor (by an I/O port) and it is assumed to be logic HIGH when the system is running in ON mode and it will be logic LOW when it is in STBY mode. (It is considered that logic HIGH is minimum 2.5V DC in most digital systems.)

CASE 1 (STB is ON)

[0017] When the Set-Top Box is in ON mode, **STBY** signal will be HIGH (-3.3V DC). Since the DC voltage on **R6** resistor would be bigger than threshold voltage of **Q2** transistor (which is -0.7V). The transistor would run in "saturation" mode. So, the collector voltage of **Q2** will be around 0.1V. Then **R1** and **R5** will run like voltage divider resistors from **V1** (= 5V) to 0.1V. Consequently, there will be about 0.45V on the junction point of **R1** and **R5** which is connected to Gate of **X1** MOSFET.

[0018] If Gate-Source voltage (V_{GS}) of **X1** is lower than -1V (about -4.55V above case), then **X1** lets a current flow - which is enough to supply Video Filter Circuit - from its Source to Drain. In Figure-2 current flow will be from **V1** to **VCC_F**. **X1** has a low voltage drop on Source-Drain connection when current flow occurs, so **VCC_F** is almost equal to **V1**.

There is no dependence of **PIN8_VCR** signal, in this case because;

a. If **PIN8_VCR** is present it will have a DC value bigger than threshold voltage of **Q1** and the collector voltage will be about 0.1V similar to **Q2**. **R4** would be another voltage divider component but the Gate voltage of **X1** would be lower than -0.45V, so there would still present a current flow from PSU to Video Filter Supply.

b. If there is no input from **PIN8_VCR** (no connection) then **Q1** transistor will be OFF (can be considered as open circuit) and power control can only done by **Q2**.

CASE 2 (STB is in Standby):

[0019] In this case **STBY** signal from microprocessor is logic LOW (near 0V DC) and **Q2** will be OFF. So there won't be any power control by **Q2**. Then **X1** is driven from

only **Q1** transistor.

a. If there is no input in VCR SCART, **PIN8_VCR** will be open - no voltage will be present in **Q1** transistor's base - and **Q1** will be in OFF mode. Since there is no current flow through **R4** and **R5** resistors - there won't be any current flow on **R1** and it will maintain a virtually short circuit between **V1** and Gate of **X1**. This implies that V_{GS} is about 0V (not $< -1V$), so there won't be any current flow from source to drain. That means **VCC_F** will not be supplied and there won't be power consumption on video filter circuits.

b. If there is a device connected on VCR SCART then **PIN8_VCR** will be $>4.5V$ and **Q1** transistor will begin to run in Saturation mode. So, Gate voltage of **X1** will be around 0.45V (as above) and current flow through video filter would start.

[0020] Within the present invention, a set top box receiver having SCART Loop Thorough feature is disclosed; where a set top box operating at standby mode will disable components used for SCART Loop Through feature upon absence of an external device signal, where a significant amount of energy will be saved.

[0021] Advantageously upon prior art devices and methods is that the device and method according to the invention does not require a system wake-up just for SCART Loop Through operation. It can also be implemented by a simpler circuitry. It has the flexibility to match most of the 2- SCART designs.

[0022] By the addition of input detection and power control circuit according to the invention video buffers can be run or shut down depending on the device (ON/STBY) and external input (VCR SCART) status. Detection circuit may respond any of these conditions quickly since it is driven directly by Standby and Slow Blank signals.

Claims

1. Electrical consumer device (1) having a first and second SCART inputs for connection to a first and second electrical device, said device (1) comprising a Power Supply Unit (8), an Audio and Video Switching Circuit section (4) and a Video Buffer and Filter section (5) to allow for SCART Loop Through functionality, **characterized in that** said electrical consumer device (1) additionally comprises:

- a. a VCR-input and power control section (7) to monitor the stand-by mode operation of said device (1) and the connection of the first electrical device, and
- b. switching means (X1) to switch off said Video Buffer and Filter section (5) when both conditions of Stand-by mode of said device (1) and

lack of connection of the first electrical device are met at the same time.

2. Electrical device according to claim 1 **characterized in that** said electrical device (1) is a set-top box (STB) or a DVD player or a Personal Video Recorder (PVR).

3. Electrical device according to claim 1 **characterized in that** said first electrical device is a Video-Cassette Recorder (VCR) or a DVD player and said second electrical device is a television set or equivalent apparatus.

4. Electrical device according to claims 1 to 3, **characterized in that** said VCR-in and power control section (7) has switching means (X1) to allow transfer of power from said Power Supply Unit (8) to said Video Buffer and Filter section (5), whereby power is switched off when said two conditions of Stand-by mode of said device (1) and lack of connection of the first electrical device are met at the same time.

5. Electrical device according to claims 4 **characterized in that** said switching means (X1) is a P-Channel MOSFET whose Base is connected via resistors (R4 and R5) to the collectors of two switching NPN transistors (Q1 and Q2) whose emitters is connected to ground and whose bases is respectively connected to the first SCART input and to the Stand-by signal (9) so that when said two conditions of Stand-by mode and lack of connection of the second electrical device are met at the same time Q1 and Q2 will be both switched off and X1 will be also switched off so that no power is supplied to said Video Buffer and Filter section (5).

6. Electrical device according to claims 1 to 5 **characterized in that** the presence of the first electrical device is monitored using the Slow Blank signal (6) available at pin 8 of the SCART connection to said first device.

7. A method for reducing power consumption of an electrical consumer device (1) having Loop Through feature and including a video buffer and filter section, said device having a first and a second SCART inputs for connection to a first and second electrical device, **characterized by the steps of**

- a) monitoring if said device in stand-by mode,
- b) monitoring if said first electrical device is connected to said electrical device (1)
- c) verifying the simultaneous presence of two conditions of operation in stand-by mode of said electrical device and lack of connection of the first electrical device, and ,if so,

d) actuating a switching means to switch off power supply to said video buffer and filter section, to reduce the power consumption of said electrical device when in stand-by mode.

5

8. The method of claim 1, wherein said electrical device (1) is a set-top box (STB) or a DVD player or a Personal Video Recorder (PVR) and said second electrical device is a television set or equivalent apparatus.

10

15

20

25

30

35

40

45

50

55

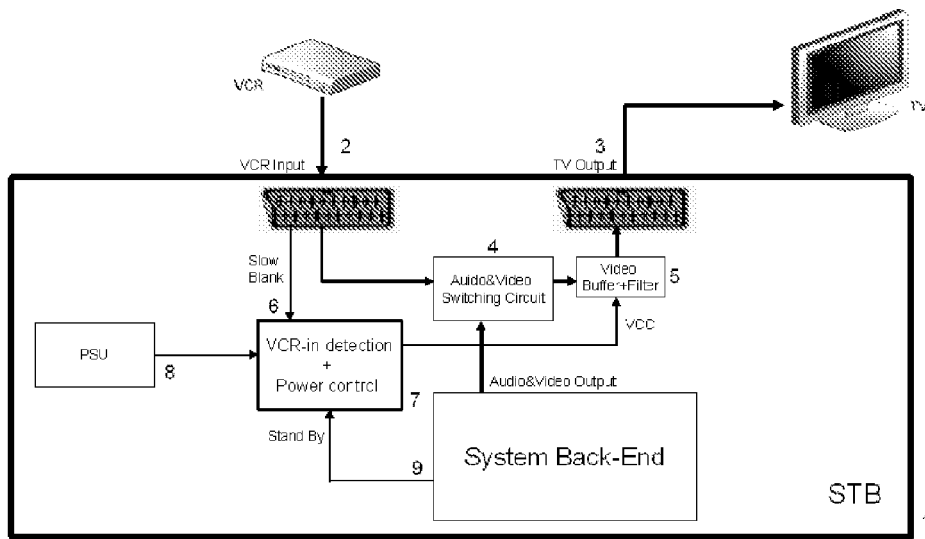


Figure-1

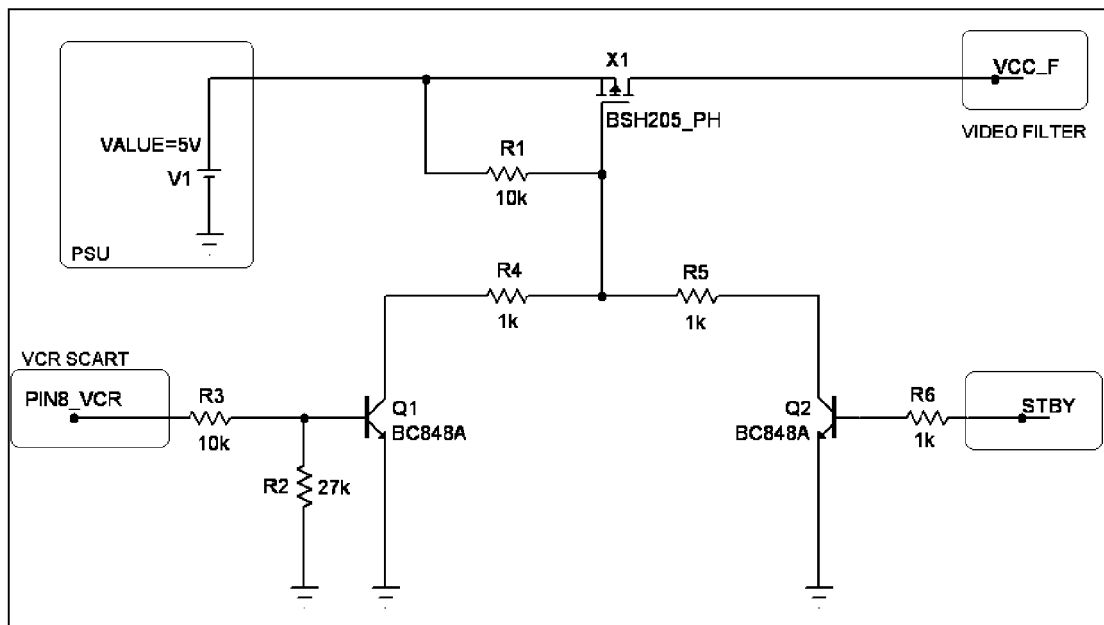


Figure-2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1045584 B1 [0008]